# CS 6041 Theory of Computation

# Homework 1

**Make sure you follow the instruction before submission:**

**1, Any late submission due to whatever reason will not be graded.**

**2, The answer should be written in BLUE and the figure can be any color. The wrong format submission might not be considered.**

**3, The submission file must be in PDF. Any other format (i.e., docx, pages) will not be graded. We don’t accept the hand-written submission.**

Lecture: Overview - Introduction

1. a, b ∈ N (positive integers), prove that: a mod b = b mod a iff a = b (20 points)

Lecture: Overview - Introduction

1. Prove or disapprove that: If a, b ∈ Z (integers), then a2 – 4b ≠ 2 (20 points)

Lecture: DFA – NFA

1. (20 points) Please give the state diagram of a DFA for the language given. In all parts, Σ = {a, b}.
2. {w| w has an even number of a’s}
3. {w| w has one or two b’s}
4. {w| w has even length}
5. {w| w has an odd number of a’s}

Your solution should be a DFA solution.

Lecture: RL-RE

1. Give regular expressions that describe the languages. In all parts, the alphabet is {0,1}. (20 points)

For the correct format, please check our examples in slides and use the following symbols: 0,1, Σ, \*, ( ), U.

Other formats like this ^1(0+1)\*$ will not be graded.

1. {w| w starts with 0 and has an odd length}
2. {w| w starts with 1 and has an even length}
3. {w| w contains at least two 0s}
4. {w| w contains at most one 1}

Lecture: NRL

1. (20 points) Let B = {1ky| y ∈ {0,1}∗ and y contains at least k 1s, for k ≥ 1}. Show that B is a regular language.

Let C = {1ky| y ∈ {0,1}∗ and y contains at most k 1s,for k≥1}. Show that C isn’t a regular language.